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INSTITIÚID ÁRD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

Annual Report of the work of the
Institute and its Constituent
Schools presented by the Council
to the Minister for Education in
respect of the Financial Year
1952-53.

INSTITIUID ÁRD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

Annual Report of the work of the Institute and
its Constituent Schools presented by the Council
for the Financial Year 1952-53

In accordance with the provisions of Section 29 of the Institute for Advanced Studies Act, 1940 (No. 13 of 1940), the Council of the Institute has the honour to present to the Minister for Education for submission to the Government a report of the work and activities of the Institute and its Constituent Schools for the financial year ending 31st March, 1953.

The general purpose which it is hoped to accomplish is clearly stated in the Act establishing the Institute, namely, the Institute for Advanced Studies Act, 1940 (No. 13 of 1940) and in the Establishment Orders establishing the three Constituent Schools, namely, the Institute for Advanced Studies (School of Celtic Studies) Establishment Order, 1940, the Institute for Advanced Studies (School of Theoretical Physics) Establishment Order, 1940, and the Institute for Advanced Studies (School of Cosmic Physics) Establishment Order 1947, and need not be referred to here. It is deemed desirable, however, to include in the report for the purposes of record certain particulars about the constitution of the Council of the Institute and of the membership of the Governing Boards of the three Constituent Schools on the 31st March 1953.

The report is presented under the following principal heads:-

- I - Constitution of the Council of the Institute and of the Governing Boards of the three Constituent Schools on the 31st March, 1953.
- II - Report of the Governing Board of the School of Celtic Studies.
- III - Report of the Governing Board of the School of Theoretical Physics.
- IV - Report of the Governing Board of the School of Cosmic Physics.

I - Constitution of the Council of the Institute and of the Governing Boards of the three Constituent Schools on the 31st March 1953

1. THE COUNCIL OF THE INSTITUTE.

Chairman:

Right Reverend Monsignor Patrick Browne, M.A., D.Sc.,
President, University College, Galway.

Ex-Officio Members:

Dr. Michael Tierney, M.A., D.Litt.,
President, University College, Dublin;

Dr. Albert J. McConnell, M.A., M.Sc., Sc.D.,
Provost, Trinity College, Dublin;

Right Reverend Monsignor Patrick Boylan, D.D., M.A., D.Litt.,
President, Royal Irish Academy.

Members Appointed by the Governing Boards of the Constituent Schools:

Professor Michael A. O'Brien, M.A., Ph.D.;

Professor Felix E. W. Hackett, M.A., M.Sc., Ph.D.;

Professor Erwin Schroedinger, M.A., Ph.D., D.Sc., F.R.S.;

Professor Ernest T. S. Walton, M.A., M.Sc., Ph.D., F.T.C.D.;

Professor Leo W. Pollak, Ph.D.

2. THE GOVERNING BOARD OF THE SCHOOL OF CELTIC STUDIES.

Chairman:

Right Reverend Monsignor Patrick Boylan, D.D., M.A., D.Litt.

Senior Professors:

Michael A. O'Brien, M.A., Ph.D.;

Daniel A. Binchy, M.A., Ph.D., B.L.;

Myles Dillon, M.A., Ph.D.

Appointed Members:

Miss Áine de Paor, M.A., Ph.D.;

Reverend John Ryan, S.J., M.A., D.Litt.;

Reverend Francis Shaw, S.J., M.A.;

Éamonn Mac Giolla Iasachta, M.A., D.Litt.;

Ernest Gordon Quin, M.A., F.T.C.D.;

Reverend Donnchadh Ó Floinn, M.A.

3. THE GOVERNING BOARD OF THE SCHOOL OF THEORETICAL PHYSICS.

Chairman:

Felix E. W. Hackett, M.A., M.Sc., Ph.D.

Senior Professors:

Erwin Schroedinger, M.A., Ph.D., D.Sc., F.R.S.;

John L. Synge, M.A., Sc.D., F.R.S.C., F.R.S.

Appointed Members:

Albert J. McConnell, M.A., M.Sc., Sc.D.;

George R. Keating, M.Sc.;

Thomas S. Wheeler, Ph.D., D.Sc., F.R.C.Sc.I.;

Reverend James R. McConnell, D.Sc.;

Máirtín Ó Tnúthail, D.Sc.;

Patrick Quinlan, B.E., M.Sc., Ph.D.

4. THE GOVERNING BOARD OF THE SCHOOL OF COSMIC PHYSICS.

Chairman:

Ernest T. S. Walton, M.A., M.Sc., Ph.D., F.T.C.D.

Senior Professors:

Leo W. Pollak, Ph.D.;

Hermann A. Brück, D.Phil., Ph.D.;

Appointed Members:

John J. Dowling, M.A., F.Inst.Phys.;

Eric M. Lindsay, M.A., M.Sc., Ph.D.;

Rev. Patrick J. I. McLaughlin, D.Sc.;

Thomas Edwin Nevin, D.Sc.;

Patrick J. Nolan, Ph.D., D.Sc.;

John H. J. Poole, M.A., B.A.I., Sc.D.;

Mariano Doporto, D.Phys.Sc.

II - Report of the Governing Board of the School of Celtic Studies.

1. ACADEMIC STAFF, SCHOLARS AND EXTERN RESEARCH WORKERS.

Senior Professors:

Michael A. O'Brien, Director of the School;
Daniel A. Binchy;
Myles Dillon.

Professors:

Brian Ó Cuív (resigned as from 1 January 1953 to take up a post as
lecturer in University College, Dublin);
James P. Carney.

Assistant Professors:

Miss Cecile O'Rahilly;
David Greene;
Rev. Cuthbert McGrath, O.F.M.

Assistant:

Miss Sheila Falconer.

Scholars:

Louis Paul Nemo (Roparz Hémeon);
Mrs. Nessa Doran;
Horst Schmidt;
Trefor Pwll Owen (from 1 October 1952).

Extern Research Workers commissioned by the School:

Dr. R. I. Best;
Mr. Seán Mac Airt;
Mr. Liam Price;
Mrs. Mary Ellen Carney;

Rev. Shan Ó Cuív;
Professor J. Vendryes;
Dr. Tomás de Bhaldraithe;
Rev. Seán Ó Catháin, S.J.;
Rev. Lambert Mc Kenna, S.J.;
Rev. Canice Mooney, O.F.M.;
Rev. Anselm Faulkner, O.F.M.;
Rev. Pádraig Ó Súilleabháin, O.F.M.;
Rev. Bartholomew Egan, O.F.M.;
Professor Heinrich Wagner;
R. B. Breatnach.

2. GENERAL LINES OF RESEARCH WORK.

During the year the School continued research in various branches of Irish, Welsh and Breton studies. At the end of the period under review five volumes, edited or written by members of the staff or by extern research workers, had been published, eighteen were in the press and material for eighteen other works was in course of preparation.

Work on the Irish Linguistic Atlas continued and approximately two-thirds of the requisite material had been collected by the end of the period under review.

Work continued on the Dictionary of Classical Modern Irish, in connection with which further large collections were made.

By resolution of the Governing Board at its meeting on January 25, 1952, it was decided that the School should undertake the publication of critical editions and translations of some of the more important Hiberno-Latin works of the Middle Ages, especially those concerned with problems of Irish history and linguistics. Professor Binchy was appointed General Editor of the Series, but the actual work of revising and editing any texts which might be submitted was entrusted to Dr. Ludwig Bieler. It was decided to call the series Scriptores Latini Hiberniae.

Rev. Professor Aubrey Gwynn, S.J., who was mainly responsible for the original scheme, has been actively associated with Professor Binchy and Dr. Bieler in drawing up a list of suitable texts and selecting editors. As the result of the efforts of Professor Gwynn and Dr. Bieler, editions of the following texts are at present in preparation:

1. Adamnan's Vita Columbae, edited by Rev. Professor J. Ryan, S.J. and Dr. Bieler;
2. Adamnan's De Locis Sanctis, edited by Rev. Professor Denis Meehan (Maynooth);
3. The Hiberno-Latin Hymns, edited by Père Grosjean, S.J. and Professor J. H. Baxter (St. Andrew's);
4. Life of St. Brigid by Cogitosus, edited by Rev. Professor Félim Ó Briain (Galway);
5. Metrical Life of St. Brigid (saec. IX), edited by Dr. Mario Esposito (Florence);
6. Latin Writings of St. Columbanus, edited by Mr. G. S. M. Walker (St. Andrew's);
7. The Penitentials of Irish provenance, edited by Rev. Professor Mitchell (Maynooth);
8. The Irish Collections of Canons, edited by members of the Pontifical Institute, Toronto;
9. The Ambrosian Commentary on the Psalms, edited by Dr. Vincenz Bulhart (Vienna);
10. Works of Sedulius Scottus, edited by Dr. Duggan and Dr. Porter (Cork);
11. Grammatical Texts of Irish provenance (saec. IX), edited by Professor Dr. Bischoff (Munich);
12. Crundmael's De arte metrica, edited by Dr. Franz Stoessl (Vienna);
13. Two pseudo-Augustine works of Irish provenance, edited by Dr. L. Bieler;
14. Writings of Bishop Patrick of Dublin, edited by Rev. Professor A. Gwynn, S.J.;
15. Itinerarium Simonis Simeonis ab Hibernia ad Terram Sanctam, edited by Dr. Mario Esposito (text and critical notes already received).

Material for Celtica, Vol. II, Part 2, was prepared and the volume was in the press.

A record of work in progress by individual members of the academic staff, scholars and research workers follows.

Senior Professors:

Michael O'Brien: Edited material for Celtica II, 2; as co-editor with Dr. Best of the Book of Leinster revised Vol.I (260 printed pages) and collated it with photostats and the manuscript; collated the text of Táin Bó Cuailgne with photostats and the manuscript; work of revision started on Galleys of II. 106-150; continued work on Indexes of Vol.I (in the press) of Corpus Genealogiarum Hibernicarum and on the texts of Vols.II and III; work progressed on a new edition of the Old Irish Life of St. Brigid and on a new edition of the Feast of Bricriu; two articles for Celtica II, 2, prepared and sent to press.

Daniel A. Binchy: Work on Early Irish Law and legal texts; the work of transcribing all the legal manuscripts with a view to publishing a Corpus Iuris Hibernici was continued; edited and saw through the press Ériu, Vol.XVI (Contributions in memory of Osborn Bergin).

Myles Dillon: Continued work on the General Index to the British Museum Catalogue; first proof of letter G for the R.I.A. Contributions to a Dictionary of the Irish Language was revised up to GR; for publication in the Mediaeval and Modern Irish Series first proof of Airne Fíngéin was read and revision of proofs of Serglige Con Culainn was completed; recorded the dialect of Inis Meadhóin in June 1952; work proceeded on a new edition of Lebor na gCert; excerpting for the Dictionary of Classical Modern Irish was continued.

Professors:

Brian Ó Cuív: Several articles for Celtica II, 2 prepared and sent to press.

James P. Carney: Work on genealogical material dealing with the O'Reillys continued; work commenced on the preparation of a Catalogue of Irish Manuscripts in the National Library.

Assistant Professors:

Miss Cecile O'Rahilly: Work on an edition of Trompa na bhFlaitheas

progressed; work on the Dictionary of Classical Modern Irish continued.

David Greene: An edition of poems on Ói Chonnacht Mag Uidhir from a Copenhagen manuscript prepared and sent to press; two articles for Celtica II, 2 sent to press; compiled and sent to press an article on "Irish Literature" for the new edition of the Encyclopedia Britannica; a new edition of Fingal Ronáin and other Leinster tales was commenced.

Rev. Outhbert McGrath, O.F.M.: Work on Plunket's Latin-Irish Dictionary continued; two volumes of Franciscan verse are in the press.

Assistant:

Miss Sheila Falconer: An edition of an Early Modern Irish version of the Quest of the Holy Grail in the press; review of La legende Arthurienne et le Graal for Celtica II, 2 sent to press; edition of short text on the Life of Pope Gregory from MS. Rawl. B 477 prepared; work proceeded on the Verbal System of the LU Táin and on excerpting works for the Dictionary of Classical Modern Irish.

Scholars:

Roparz Hémon: Continued research work on various aspects of Middle and Modern Breton; prepared and sent to press two articles for Celtica II, 2.

Mrs. Nessa Doran: Work on the bardic poems in the Book of Fermoy nearly completed.

Trefor Pwll Owen: Worked at thesis on the Irish and Welsh Court Poets.

Horst Schmidt: Worked on Modern Irish dialects.

Extern Research Workers:

Dr. R. I. Best: First volume of an edition of the Book of Leinster in the press; material for Vol. II (up to LL. 150) in the press.

Seán Mac Airt: Work progressed on a new edition of the Annals of Ulster.

Liam Price: A new volume in the series of Place-Names of Co. Wicklow in the press.

Mrs. Mary Ellen Carney: Work continued on the Irish version of the Aphorisms of Hippocrates.

Rev. Shán Ó Quív: Materials for a bibliography of the works of Canon Peter O'Leary, to appear as a supplement to Celtica II, 2 in the press.

Joseph Vendryes: Edition of Airne Fíngéin in the press; work on an Etymological Dictionary of Irish continued.

Tomás de Bhaldraithe: Work on the phonology and grammar of the Irish of Cois Fhairrge in the press.

Rev. Seán Ó Catháin, S.J.: Edition of Betha Muire in the press.

Rev. Lambert McKenna, S.J.: Edition of text on Metrical Defects in Bardic Poetry and a Commentary on the Introduction to the Irish Grammatical Tracts prepared for publication.

Rev. Canice Mooney, O.F.M.: An edition of Seanmónta Chúige Uladh in the press; an edition of Poenitentiarium Sancti Maelruain for Celtica II, 2 sent to press.

Rev. Anselm Faulkner, O.F.M.: Edition of Parrthas an Arma in the press; editions of Beatha Dhiadha and Scáthán Spioradálta in progress.

Rev. Pádraig Ó Súilleabháin, O.F.M.: Editions of Beatha San Froinsias and Lucerna Fidelium in the press; work on editions of Buaidh na Croiche and An tAiridheach Ríogha in progress.

Rev. Bartholomew Egan, O.F.M.: An edition of O'Hussey's and O'Mulconry's grammars in the press.

Heinrich Wagner: Continued collection of material for the Irish Linguistic Atlas in various counties.

R. B. Breatnach: Worked on Déisi Irish materials left by the late Archbishop Michael Sheehan.

J. E. Caerwyn Williams: Article for Celtica II, 2 in the press.

R. A. Breathnach: Article for Celtica II, 2 in the press.

3. SEMINAR AND LECTURES.

Professor Binchy continued his Seminar on Early Irish Law until June 1952.

Lectures on Middle and Modern Breton continued to be delivered weekly during the university terms by M. Roparz Hémon.

Professor O'Brien read a lengthy paper on Old Irish Personal Names to the Philological Society in Cambridge.

Professor Dillon gave lectures in October at Louvain, Brussels, Amsterdam and Nimwegen.

Professor Carney continued his courses on Irish and Irish Literature as Visiting Lecturer at the University of Uppsala until May 1952 and gave lectures on the Irish Element in Beowulf in Liverpool, Oxford and Cambridge in February 1953.

4. SUMMER SCHOOL.

A Summer School was held from the 15th July to the 8th August 1952. Fifty-four enrolled and attended the courses. This number included students and members of university staffs from Ireland, England, Scotland, Wales, Germany, Belgium, Holland, Austria, Sweden and the United States of America. Scholarships, kindly provided by the Department of External Affairs, were awarded to ten foreign students whose financial resources would not otherwise have permitted them to attend. Courses of lectures were delivered as follows:-

Professor O'Brien: 10 lectures on Advanced Old Irish, 7 lectures on Classical Irish Poetry;

Professor Binchy: 10 lectures on Celtic Institutions.

Professor Dillon: 18 lectures on Introduction to the Comparative Philology of the Celtic Languages and 18 lectures on Elementary Old Irish;

Professor Ó Cuív: 17 lectures on Introduction to a Modern Irish Dialect;

Professor Carney: 7 lectures on Epochs of Irish Literature;

David Greene: 18 lectures on Introduction to Early Welsh.

5. STATUTORY PUBLIC LECTURE.

The Statutory Public Lecture under the auspices of the School was delivered by Professor Myles Dillon in University College, Dublin, on Thursday, 15th February 1953. Professor Dillon's subject was Linguistic Borrowing and Historical Evidence.

6. PUBLICATIONS.

(a) Published by the Institute:

SCÁTHÁN SHACRAMUINTE NA HAITHRIÚCHE.

Cainneach Ó Maonaigh, O.F.M. a chuir in eagar.
(Scribhinní Gaeilge na mBráthar Mionur, ImI.I).

pp. xlvii + 257

Price 15s.

Date of
Publication

4/4/52

PÁRLIAMENT NA mBAN. Edited by Brian Ó Cuív.

pp. xlv + 270

Price 12s. 6d.

10/7/52

BUILE SUIBHNE. Edited by J. G. O'Keeffe.

(Mediaeval and Modern Irish Series, Vol.I.
Reprinted.)

pp. vii + 110

Price 3s. 6d.

24/9/52

FIVE SEVENTEENTH-CENTURY POLITICAL POEMS.

Edited by Cecile O'Rahilly.

pp. ix + 181

Price 10s. 6d.

15/12/52

RIALACHAS SAN FROINSIAS.

Pádraig Ó Súilleabháin, O.F.M. a chuir in eagar.
(Scribhinní Gaeilge na mBrathar Mionur, ImI.II).

pp. xxx + 134

Price 10s. 6d.

27/3/53

(b) Contributions to periodicals:

M. A. O'Brien: A Middle Irish Poem on the Birth of Aedán mac Gabráin and Brandub mac Echach - Ériu, 16, 157, 1952.

D. A. Binchy: The Saga of Fergus mac Léti - Ériu, 16, 33, 1952.

D. A. Binchy: The Leech in Ancient Ireland - Special Medical Congress Number of the Irish Medical Journal, 1952.

Myles Dillon: The Finding of Cashel - Ériu, 16, 61, 1952.

Brian Ó Quív: Some Developments in the Imperative Mood - Ériu, 16, 171, 1952.

Brian Ó Quív: Two Poems of Invocation to St. Gobnait - Éigse, 6, 326, 1952.

David Greene: Middle Quantity in Irish - Ériu, 16, 212, 1952.

H. Wagner: Varia - Zeitschrift für Celtische Philologie, 24, 91, 1953.

Roparz Hémon: Review of Yezhadur bras ar Brezhoneg - Zeitschrift für Celtische Philologie, 24, 157, 1953.

III - Report of the Governing Board of the School of Theoretical Physics:

1. ACADEMIC STAFF AND SCHOLARS.

Senior Professor:

Erwin Schroedinger, Director of the School;

John L. Synge.

Visiting Professors:

A. John Coleman;

Cornelius Lanczos;

Francis J. Murray.

Scholars:

Rev. J. McMahon (left September 1952 and was granted a studentship to enable him to continue special studies in U.S.A.);

O. Bergmann (left July 1952);

A. Bork (left July 1952);

N. Balázs (left December 1952);

F. Roesler;

M. J. Klein (entered September 1952);

J. R. Pounder (entered September 1952);

V. G. Hart (entered September 1952);

H. F. Sandham (entered September 1952);

P. M. Daykin (entered September 1952);

P. J. Donohoe (entered October 1952);

J. G. Roche (entered January 1953);

G. H. F. Gardner;

S. O'Brien.

Technical Assistant:

Miss Evelyn Wills.

2. GENERAL LINES OF RESEARCH WORK.

Studies on the new unified field theory (Einstein - Straus - Schroedinger) were continued. In discussions with Dr. C. Lanczos (guest

professor) it turned out that the purely affine (Schrödinger) version, which demands the so-called cosmological term, is after all intrinsically different from the Einstein - Straus version, and avoids a fundamental objection that can be raised against the latter. Another line of research led by Dr. Schrödinger, is engaged with reconsidering the current interpretation of quantum mechanics. Several papers were published with the scope of showing, by epistemological discussion, the inadequacy of the current view.

Professor Synge continued his work on the space-time geometry of de Broglie waves, and has completed a book on the subject which will be published by the Cambridge University Press. He published a paper dealing with the application of the method to the relativistic two-body problem. He is writing a book on the theory of relativity which will have some novelty in presentation and in contents; in particular, some interesting results have emerged regarding the determinateness of the result of a collision between particles with given intrinsic angular momenta.

Work on the concept of rigidity in relativity has continued with the co-operation of Messrs. Gardner and Pounder. Born's definition of rigidity has been found to yield a satisfactory theory of a rigid surface, and the forms of such surfaces when in motion have been investigated.

Professor Synge wrote a paper on the instability of a toy known as the tippe-top. However, the theory given in that paper is not adequate and a more satisfactory investigation has been made with the collaboration of Mr. O'Brien.

With the collaboration of Mr. Hart, work is proceeding on a book on the method of the hypercircle for the solution of boundary value problems of mathematical physics. Numerical calculations required for this work have been facilitated by the purchase of a Madas calculating machine.

Mr. Donohoe has been investigating some problems in elasticity and hydrodynamics, but no new results have so far been obtained.

Rev. J. McMahon was granted a Studentship of the Institute in September 1952 and has since been working with Professor Szegő at Stanford University. His work on the electrostatic capacity of a cube is now in course of publication.

Numerical work on the order-disorder problem, using certain newly available computing facilities, was carried out by Professor Murray, who also lectured in the seminar on the logical design of computing machines.

In collaboration with Mr. C. B. A. McOusker (School of Cosmic Physics), Dr. Roesler continued to work on extreme energy events produced by cosmic rays. One paper in this field was published and a second one is in course of publication. Dr. Roesler also investigated the diffusion of cosmic radiation in galactic and intergalactic space, and contributed to current discussions on the interpretation of wave mechanics and its application to macroscopic bodies.

Dr. Klein's attention was given mainly to problems in the statistical mechanics of systems not in equilibrium. Along this line he has done some work on the Boltzmann integro-differential equation, based on a recent paper by E. Wild. He has also attempted, so far unsuccessfully, to clarify the statistical foundations of the irreversible thermodynamics of Prigogine et al., and completed a short paper on the concepts of order and entropy as related to the biological concept of organization.

Mr. Sandham worked in the field of number theory and in the summation of series from elliptic functions.

Dr. Lanczos carried out investigations on a number of topics, including field equations and motion law; radiation of the electron; the quadratic action principle of general relativity; application of Fourier transforms to periodogram analysis; and problems in applied mathematics. With the collaboration of Mr. Roche, he also carried out some research on the eigenfunctions of an infinite slab.

Dr. Daykin worked on problems in quantum and classical electrodynamics.

The results of his investigation to date are reported in a paper which has been submitted for publication to the Physical Society (London). At present he is working with Professor Lanczos on the problem of radiation damping in classical electrodynamics. They are applying a new and as yet untried mathematical technique to the problem of obtaining the law of motion of a charged particle.

3. SEMINAR AND LECTURES.

During the summer term Professor Coleman lectured in the Seminar on Wednesdays on Eddington's Fundamental Theory.

After the summer vacation, Mr. McCusker (of the School of Cosmic Physics) gave a course of lectures on High Energy Nuclear Interaction, and this was followed by a number of lectures by Professor Lanczos on various topics in applied analysis, and a lecture by Professor Synge on a simple formula bounding multiple integrals. In the second winter term, Professor Lanczos spoke on the quadratic action principle of general relativity, and later Professor Schrödinger lectured on unified field theory.

As usual, members of staff and students from Trinity College, Dublin, University College, Dublin, and St. Patrick's College, Maynooth, as well as members of the two physics schools of the Institute, attended these courses.

4. COLLOQUIUM.

At a colloquium held at the School from July 1 to July 9, the following lectures were given:-

Professor P. A. M. Dirac (University of Cambridge): four lectures on "Foundations of Electrodynamics".

Dr. C. W. Kilmister (Kings College, London): two lectures on "Quaternion Approach to Wave-Tensor Calculus".

Professor J. L. Synge: two lectures on "Hamilton's Method in Geometrical Optics applied to the Theory of de Broglie Waves in Space-time".

Professor E. Schrödinger: two lectures on "The Meaning of Wave Mechanics".

Considerable interest was aroused by the colloquium, and there was a very good attendance of physicists from abroad as well as from Irish universities, the number of participants being 52.

5. STATUTORY PUBLIC LECTURES.

The Statutory Public Lectures under the auspices of the School were delivered in Trinity College, Dublin, on Thursdays 5 and 12 March, at 4.30 p.m., by Professor E. Schrödinger. The lectures concluded a series under the general title "Science at Play", of which the first lecture had been given in University College, Dublin, on 20 March 1952. A great many illustrations to the lectures were given, both by slides and by practical demonstrations.

6. VISITING PROFESSORS.

During the period under review, three visiting professors spent periods of varying lengths at the School, as follows:

Professor A. J. Coleman (University of Toronto) from April 1952 to September 1952;

Professor C. Lanczos (National Bureau of Standards, Los Angeles);

Professor F. J. Murray (Columbia University, New York) from February 1953 to May 1953.

7. VISITING LECTURERS.

Professor H. S. M. Coxeter, F.R.S., of the University of Toronto, visited the Institute on May 12, 1952, and lectured to the Seminar on "World Structure and Honeycombs".

Professor W. Prager (Brown University, Rhode Island) visited the Institute on June 16th 1952 and lectured to the Seminar on "Limiting States of Equilibrium in Perfectly Plastic Solids".

Professor A. Lichnerowicz (Collège de France) visited the Institute in March 1953 and lectured to the Seminar on "Empty Stationary Space-Times in General Relativity" and on "Relativistic Hydrodynamics for a Charged Fluid".

Unfortunately the arrangements for lectures by Professor R. E. Peierls (University of Birmingham) had to be cancelled, owing to illness.

8. DISTINGUISHED VISITORS.

While on a short visit to Dublin, Professor G. Szekeres (University of Adelaide) visited the School and lectured to the Seminar on some aspects of unified field theory.

9. PROFESSORS' ACTIVITIES.

Dr. Schrödinger attended the European Forum at Alpbach during the last week of August, 1952, and, in the following fortnight, the Rencontres Internationales de Genève, where he lectured on "Unsere Vorstellung von der Materie" and attended the "Entretiens" (discussion).

Dr. Synge lectured at the University of Liverpool on May 23 1952 on "The electrostatic capacity of a cube" and to the British Association in Belfast on September 5, 1952, on "Space-time pictures and de Broglie waves". In October 1952 he lectured on "The rigid body in relativity" and "Space - time pictures and de Broglie waves" on 13th and 14th respectively at Reading, and on "A formula for bounding integrals" on 17th at Kings College, Newcastle-on-Tyne (University of Durham). At University College, Galway, he delivered a popular lecture on "Form and Number" and advanced lectures on "Instability of spinning bodies" and "Space-time pictures and de Broglie waves" on March 10 and 11, 1953.

At the inaugural meeting of the Dublin University Mathematical Society on 20 November 1952, Dr. Lanczos spoke on "The limit theory of Archimedes". He also spoke at St. Patrick's College, Maynooth, on March 11, 1953, on "Motion law of relativity" and at the School of Cosmic Physics on 12 March 1953 on "Fine structure analysis of periodic phenomena".

10. PUBLICATIONS.

- (1) Communications of the Dublin Institute for Advanced Studies - Series A: Physics:

No. 9 - Jump Conditions at Discontinuities in General Relativity.
By Stephen O'Brien and John L. Synge.

pp. 20. Price 2s. Published 30 October 1952.

(2) Contributions to Periodicals:

E. Schrödinger: The Meaning of Wave Mechanics - Louis de Broglie,
Physicien et Penseur; Paris, Albin Michel, 1952.

Unsere Vorstellung von der Materie - L'homme devant la
science; Neuchâtel (Switzerland), Baconnière, 1952.

J. L. Synge: On a Case of Instability Produced by Rotation -
Phil. Mag. 43, 724, 1952.

Review of Sir Edmund Whittaker's "A History of the Theories
of Aether and Electricity (The Classical Theories)":
Edinburgh, Nelson, 1952; B.J.F.S., 3, 204, 1952.

Review of Professor C. Möller's "Theory of Relativity":
Oxford, Clarendon Press, 1952; Nature 171, 140, 1953.

A Simple Bounding Formula for Integrals - Can. J. Math. 1,
46, 1953.

Primitive Quantization in the Relativistic two-body Problem -
Phys. Rev. 89, 467, 1953.

P. C. Roesler and C. B. A. McOsker: On the Growth of a Cosmic Ray
Initiated Jet in a Nucleus - Il Nuovo Cim. 10, 127, 1953.

The following are in course of publication:

(3) Book:

Geometrical Mechanics and de Broglie Waves. By J. L. Synge.
University Press, Cambridge (Monographs in Mechanics and
Applied Mathematics).

(4) Contributions to Periodicals:

Rev. J. McMahon: Lower Bounds for the Electrostatic Capacity of a
Cube. Proc. R.I.A.

P. C. Roesler and C. B. A. McOsker: On the Anisotropic
Distribution of Secondaries in Extreme Energy Cosmic Ray Stars.
Physical Review.

M. J. Klein: Order, Organization and Entropy. B.J.F.S.

H. F. Sandham: A Square as the Sum of 7 Squares. Quart. J. Math.

A Square as the Sum of 9, 11 and 13 Squares. London
Mathematical Society.

Some Infinite Series. American Mathematical Society.

Two Series of Partitions. American Mathematical Monthly
Magazine.

N. L. Balázs: Do the Heisenberg uncertainty relations prohibit Maxwell's demon from operating? Comptes Rendus des Seances de l'Academie des Sciences.

J. L. Synge: The Fundamental Theorem of Electrical Network (a note). Quart. Appl. Math.

Flow of Viscous Liquid through Pipes and Channels. American Mathematical Society; Proc. of Symposia in Applied Mathematics.

Relativistically Rigid Surfaces. Von Mises Anniversary Volume.

On the Transfer of Energy between Electromagnetic Dipoles Proc. R.I.A.

P. M. Daykin: A Note on the Meaning of Mass Renormalization. Proc. Phys. Soc., A.

IV - Report of the Governing Board of the School of Cosmic Physics.

A. Astronomical Section, Dunsink Observatory

1. ACADEMIC STAFF AND SCHOLARS

Senior Professor: H. A. Brück.

Chief Assistant: H. E. Butler.

Research Associate: Máire T. Brück (as from 1 August 1952).

Assistant: Máire T. Brück (until 31 July 1952).

Assistant (Part-time): F. J. O'Connor

Scholar: A. N. Argue (until 31 January 1953)
G. I. Thompson (as from 1 February 1953).

2. EQUIPMENT.

A 28-inch concave mirror has been purchased which is to replace the present 15-inch mirror in the telescope on the roof of the main building. A new telescope tube and mounting have been designed and are being constructed in co-operation with the Engineering Department of University College, Dublin. The new telescope is to become the main instrument for stellar observations and is to be used chiefly for photoelectric photometry. Its greater light-gathering power as compared with that of the 15-inch will make it possible to extend the range of observation to fainter stars.

A Troughton and Simms plate-measuring machine has been obtained on loan from the Oxford University Observatory through the kindness of Professor H. H. Plaskett. The machine is to serve for preliminary measurements of the star plates which have been secured with the Armagh-Dunsink-Harvard Schmidt telescope in Blomfontein, South Africa. For the final photometric analysis of these and future plates an Iris Plate-photometer has been ordered from the Eichner Instrument Company, Clifton, N.J., U.S.A. This instrument, only recently designed, has been proved especially suitable for the measurement of the very small star images of Schmidt plates for which it is already in use at observatories in various countries and particularly at the Mount Wilson and Palomar Observatories in California.

3. RESEARCH WORK.

Stellar Observations: Photoelectric observations of standard stars in the North Polar Sequence and of the minor planet Vesta have been carried out by Mr. Argue using the 12-inch and 15-inch telescopes. The results, apart from their intrinsic interest, have afforded a test of a new photometer incorporating an E. M. I. Photomultiplier which was constructed by Mr. Argue; they have been published by the Royal Irish Academy.

Mr. Argue has also written up a treatise on the general problem of photoelectric stellar photometry which he has submitted as a thesis for the M.Sc. Degree to Trinity College, Dublin.

Further work has been done on the method of making simultaneous photoelectric observations of two stars, and steps have been taken to allow for the inclusion of a suitable device for such observations in the construction of the new 28-inch telescope.

Lunar occultations have been observed whenever weather conditions allowed, and a list of occultation times has been passed on to the Nautical Almanac Office, Royal Greenwich Observatory.

Armagh-Dunsink-Harvard-Telescope: Dr. Butler who went to Bloemfontein in January 1952, spent four months in South Africa during which time he has taken about 150 plates with the ADH telescope chiefly of open star clusters. About a dozen such clusters have been photographed in the three standard spectral regions, red, blue and ultraviolet, following a method introduced into stellar photometry by W. Becker.

Apart from open star clusters Dr. Butler has secured also, plates of high quality of various regions in the Milky Way. The definition of the star images on these plates is excellent right to the edge of the field which is 5 degrees in diameter, and it is clear that the performance of the telescope comes up to the highest expectations.

While in South Africa, Dr. Butler has visited a number of other observatories and has secured some plates with the 74-inch reflector of the Radcliffe Observatory, Pretoria, with the kind permission of its Director, Dr. A. D. Thackeray. Dr. Butler returned to Dunsink at the beginning of June.

Stellar Statistics: A method has been evolved by Dr. Butler which promises to be of considerable value for the practical solution of the problem of star-counting which has become pressing on account of the large numbers of stars - of the order of a million per plate - which are visible on the ADH photographs. A preliminary account of the method has been published and a detailed description is in preparation.

Solar Observations: The solar installation has been used for photographic and photoelectric work. A number of minor improvements have been made to the solar spectrograph whose performance has been tested in every detail. In its present condition the spectrograph is found to be equal in quality to the best solar instruments in existence. An account of the various tests and their results is being prepared. Dr. M. T. Brück with the assistance, during the last two months, of Dr. G. I. Thompson, has been in charge of the solar instruments. A programme on line intensities in the ultraviolet spectrum of the Sun has been started. Experiments have also been carried out on the photoelectric scanning of the solar spectrum with a view to improving earlier photoelectric measurements of line profiles done at Cambridge.

Solar Eclipse Results: The observations of the spectrum of the solar chromosphere, made by Professor Brück and Dr. D. A. Jackson at the total solar eclipse of 1952, February 25, have been analysed with the assistance of Dr. M. T. Brück and the results have been published by the Royal Society. It has been shown in particular that the type of measurement of line widths used at the eclipse for the first time is feasible and with somewhat larger equipment than was available at Khartoum, would lead to a final determination of the temperature of the solar chromosphere. Preliminary plans have been drawn up in conjunction with the Eclipse Committee of the Royal Society and the Royal Astronomical Society with a view to observe the next total solar eclipse in 1954 in Sweden which will be the most favourable eclipse within easy reach of Ireland until 1999.

Other Work: Mr. O'Connor's work on solar eclipses visible in Ireland between 400 and 1000 A.D. has been published by the Royal Irish Academy together with an appendix pertaining to conditions at Iona.

4. CONFERENCES.

Professor and Mrs. Brück attended a special meeting of the Royal Astronomical Society at Leeds at which Professor Brück gave a preliminary account of eclipse results during a symposium on the Khartoum eclipse. At a London Meeting of the Royal Astronomical Society Professor Brück gave an account of the work done on behalf of Dunsink with the ADH telescope.

In September Professor Brück represented Ireland at the Assembly of the International Astronomical Union in Rome which was also attended by Dr. M. T. Brück, Dr. H. E. Butler and Mr. Argue. Members of Dunsink serve now on six Commissions of the Union, Professor Brück on four and Dr. M. T. Brück and Dr. H. E. Butler on one each. Professor T. E. Nevin has been elected a member of the Commission on Stellar Spectroscopy and of the Subcommittee on Molecular Spectra.

Accounts of work at Dunsink on prominences, photoelectric measurement of line profiles and stellar astronomy were given at meetings of the appropriate Commissions.

At the last general meeting of the Union an official invitation was issued by Professor Brück to the delegates, more than 400 astronomers from 35 different countries, to hold the next Assembly of the Union in 1955 in Dublin. This invitation was accepted with great enthusiasm.

During the week following the meeting of the International Astronomical Union Professor and Mrs. Brück attended a Symposium on Solar Physics held in Rome and Florence under the auspices of the Italian National Academy of Sciences. Professor Brück contributed a paper on the solar chromosphere which is being printed by the Academy.

5. PERSONAL.

Mr. Argue who held a Scholarship at Dunsink for over two years, has been appointed Observer at the Cambridge Observatory on 1st February 1953. His place as Scholar has been taken by Dr. G. I. Thompson who is a graduate of Queen's University, Belfast, and has obtained a doctorate in spectroscopy at the Imperial College of Science, London.

6. LECTURES.

Two Statutory Public Lectures on "The Structure and History of the Universe" have been given by Professor Brück on March 4 and 11 in the Physics Theatre, University College, Dublin. Other lectures by Professor Brück have included one to the Astronomical Society of Cambridge University, one to the Royal Dublin Society and one to members of University College, Galway. Professor Brück and other members of the staff have also given a number of lectures to general audiences.

7. OPEN NIGHTS.

The Observatory has been open to the public as usual on the first Saturday of each month. Other groups of people have visited the Observatory by special arrangement. About 4000 visitors have come out in the course of the year. Astronomers who visited the Observatory included Rev. Dr. D. O'Connell, S.J., Director of the Vatican Observatory, Professor W. M. H. Greaves, Astronomer Royal for Scotland, Dr. R. H. Stoy, H. M. Astronomer at the Cape, and Professor C. B. Lovell, Director of the Jodrell Bank Station, Cheshire.

8. PUBLICATIONS.

Contributions from the Dunsink Observatory:

- No.5. F. J. O'Connor: Solar Eclipses visible in Ireland between 400 and 1000 A.D.
(Proc. Roy. Irish Acad. 55 A, 61, 1952).

Summary: A complete list of all partial and total solar eclipses which were visible in Ireland between 400 and 1000 A.D. is given for the benefit of chronologists. The calculated data include the times of the beginning and end of the eclipses and their phase.

- No.6. A. N. Argue: Photoelectric Stellar Photometry using an E. M. I. Photomultiplier.
(Proc. Roy. Irish Acad. 55 A, 117, 1953).

Summary: The paper contains an account of the performance of a new stellar photometer which has been constructed by the author. The sensitivity and accuracy of the photometer is shown to be superior to that of earlier types. The paper gives also some new data, obtained with the photometer, of the colours of standard stars, and of the periodic light variation of the minor planet Vesta.

- No.7. H. A. Brück and D. A. Jackson: An Attempt to Measure Interferometrically the Widths of Chromospheric Lines at the Total Solar Eclipse of 25 February 1952.
(Proc. Roy. Soc. Ser.A, 216, 183, 1953).

Summary: The paper contains a description of the equipment with which the total solar eclipse of 1952 has been observed at Khartoum. Details of the chromospheric spectra which have been secured, are given, and a complete analysis of the data is presented. This includes an account of subsidiary experiments with an interferometer carried out at Dunsink. Minimum values for the widths of certain chromospheric lines are given, and it is shown that the interferometric method can be applied successfully to eclipse observations.

Dunsink Observatory Reprints:

- No.6. H. E. Butler: An Indirect Method of Starcounting.
(The Observatory 73, 80, 1953).

Summary: A new method is described which makes it possible to derive the numbers of stars of different brightness on a photographic plate without actual starcounts. It is based on a photoelectric analysis of pairs of plates, copies of the original starplate, which are being moved against each other while they are scanned by a parallel beam of light. The resulting variation in transmitted light is measured by a photomultiplier and a recording camera. Its analysis produces the desired starnumbers.

In the Press:

- H. A. Brück: Measurements of Line Widths in the Flash Spectrum.
(Publ. Accademia Naz. dei Lincei).

B. Cosmic Ray Section

1. ACADEMIC STAFF AND SCHOLARS.

Senior Professor: Vacant.

Assistant Professor: C. B. A. McCusker.

Research Associate: T. E. Nevin.

Scholars: N. A. Porter;

B. G. Wilson (entered 1 September 1952);

P. D. McCormack (entered 1 November, 1952);

J. Dardis (entered, without stipend, 1 December 1952).

Progress during the year has been very satisfactory. The addition of three new scholars has doubled the academic staff. A number of investigations have been brought to conclusion, some with very interesting results. Other experiments in hand have made good progress.

The experiment on local penetrating showers from paraffin and carbon (by McCusker, Porter and Wilson) has ended and the paper on the results is in course of publication. It has been possible to find the average multiplicity of penetrating particles from carbon for a primary energy of about 30 BeV and the result is in good agreement with previous work. In the same experiment under identical conditions the average multiplicity from hydrogen was found to be much smaller and a conservative upper limit of 2.4 was given. It has been concluded that multiple production of mesons in nucleon-nucleon collisions is rare at this energy. The paper, circulated in manuscript form, has aroused considerable interest and the authors are indebted to Professor W. Heitler and Professor J. G. Wilson for their comments.

In conjunction with Dr. F. C. Roesler of the School of Theoretical Physics, Professor McCusker has concluded a theoretical investigation of cosmic ray jets of very high energy and a paper embodying the results has been published. The theory is in good agreement with experimental observations and has been able to explain some of the features of those very high energy events which had previously been very puzzling (e.g. the apparent decrease in multiplicity with increasing energy in part of the range). The theory is being extended by Dr. Terreaux of Professor Heitler's School in Zürich in an attempt to forecast the number of heavy prongs to be expected in these stars. An experiment which was suggested in the paper and which may throw considerable light on meson production at these energies has been undertaken by Dr. Ritson and his co-workers at the University of Rochester.

The experiment on the nucleon cascade in water (by McCusker, Messel, Millar and Porter) has been completed and a paper on it was read by Professor Messel at the Autumn Meeting of the American Physical Society. Good agreement with many of the predictions of theory developed by Professor Messel was obtained.

Dr. Roesler and Professor McCusker have completed an investigation (which is in course of publication) on the anisotropic distribution of secondaries in extreme energy stars. The investigation is based on the Fermi statistical theory and the authors are indebted to Professor Fermi for his comments.

Of the incomplete investigations, the experiment on the nucleon cascade in lead (now in charge of Mr. Dardis) is running well and already some interesting results have been obtained.

The magnet and cloud chamber (with Mr. Wilson in charge) has been completed. The magnet gives a field of 5100 gauss with a 5" gap and 3600 gauss with a 10" gap. Recently the magnet has been converted to oil cooling to obviate corrosion of the leads in to the coils. The cooling tower (although in an incomplete state) has at last arrived. All the electronics necessary to operate the cloud chamber and to photograph local penetrating showers have been built (by Professor McCusker, Mr. Wilson and Mr. Porter) and have been successfully tested. The excellent rate of 3 local penetrating showers per hour has been obtained. Some very high quality pictures have been obtained with the cloud chamber by Mr. Wilson.

The serials and receivers for the very extensive shower experiment have been installed at No.5 Merrion Square, thanks to the co-operation of Professor L. W. Pollak, and successfully tested. An out station has been established in an excellent situation on the roof of the College of Science. It was found originally that the received pulses from the transmitters were too small to be discriminated with complete efficiency from the noise from car ignition systems. Re-design of the modulator has however lead to an increase of more than 30 fold of the received signal and the situation, at this distance at least, is now satisfactory.

A parallel plate spark counter and its auxiliary electronics (including a 5 K V stabilised power pack) have been constructed and are about to undergo tests. It is hoped that it will be possible with this device to trigger on the gray prongs of stars and so obtain an unbiased selection of events containing penetrating particles. These would then

be investigated with a cloud chamber. The experiment is being carried out by Mr. Dardis.

An investigation with a similar object is being undertaken by Mr. McCormack. He is studying the possibility of a triggering system using the light produced in scintillators by the black prongs of a star. The necessary electronics is almost complete and the scintillating materials have been obtained. Mr. McCormack has been greatly helped by the loan of equipment from Dunsink Observatory and the Physics Department of Trinity College, Dublin.

During the year the workshop has been engaged on the construction of equipment for the magnet and in making and maintaining apparatus for the other experiments described above.

Professor McCusker gave, by invitation, a lecture to the Seminar of the Physics Department of Manchester University on the Nucleon Cascade in Water and later, a course of lectures on high energy nuclear interactions during the Autumn Term of 1952 in the Institute.

PUBLICATIONS.

Messel, H., Potts, R.D. and McCusker, C.B.A.: Theoretical results on high energy nuclear collisions in light and heavy elements.
(Phil. Mag. 43, 889, 1952).

Keeffe, D., Nevin, T.E., McCusker, C.B.A. and Porter, N.A.: On the gaseous contamination of Geiger-Müller counters.
(Nature 170, 501, 1952).

McCusker, C.B.A., and Millar D.D.: Local penetrating showers from water and carbon.
(Proc. Phys. Soc. A 65, 758, 1952.)

McCusker, C.B.A., Messel, H., Millar, D.D. and Porter, N.A.: An experimental investigation of the nucleon cascade in water.
(Phys. Rev. 88, 1216, 1952).

Roesler, F.C. and McCusker, C.B.A.: On the growth of a cosmic ray initiated jet in a nucleus.
(Nuovo Cim. X, 127, 1953).

Papers read at the Cosmic Ray Colloquium September 1951: (Communications of the Dublin Institute for Advanced Studies, Series A, No.10, 1952).

C. Geophysical Section

1. ACADEMIC STAFF AND SCHOLARS.

<u>Senior Professor:</u>	Leo W. Pollak, Director of the School.
<u>Assistant Professor:</u>	Thomas Murphy.
<u>Research Associate:</u>	P. J. Nolan.
<u>Scholar:</u>	J. C. O'Sullivan (from 3 June to 5 November 1952). J. O'Connor (from 5 January 1953).
<u>Senior Technical Assistant:</u>	Thomas J. Morley.

2. EXPERIMENTAL AND FIELD WORK.

(i) Nuclei Counters:

(a) We have now three photo-electric nuclei counters of the improved version, constructed in our workshop, at our disposal. Two of them together with two identical condensers have been built into our mobile laboratory. In addition, our van is equipped with an aspirated resistance psychrometer and the necessary accessories (hand anemometer, rotameters, intake fan, etc.).

Considerable time was spent by Pollak and Murphy on the standardisation of the counters in room air and under rather constant conditions at the coast and in higher altitudes. A detailed analysis of the influence of every single part of the counter on the extinction of the passing beam was carried out both in the laboratory and in the open which was only possible owing to the improvements in the construction.

The comparison of photo-electric counters is being continued in the laboratory using a rubber gasometer which is so large that very long series of observations can be taken over a period of days. Incidental to the comparisons, the decay phenomena of nuclei are being studied in this large volume (4000 litres) which was long considered necessary but, so far as we know, never realized.

A preliminary note on the results is being prepared, with a view to publication since the Nolan-Pollak Counter is now used not only in Ireland

but also in Switzerland, Italy and U.S.A. and has been suggested by Ch. L. Hosler, State College, Pennsylvania as a possible substitute in an attempt to salvage the Aitken method.

(b) The nuclei counter with photographic recording has been fitted with an improved dark field illumination and equipped with a photo-micrographic attachment for plates and roll films. Further improvements are under construction. Preliminary trials are up to expectations.

(ii) Micro-meteorological Survey of Ireland:

Pollak and Murphy are continuing their last year's investigation of the large and spasmodic variations in the nuclei concentration at the coast which they have described in the "Archiv". The equipment mentioned above permits the study not only of the number but also of the charge of these nuclei.

(iii) A magnetic survey of the vertical component in the area around Drogheda is being carried out by Professor Murphy in order to correlate the gravity anomaly found previously there with the vertical intensity of the magnetic field.

3. PUBLICATIONS.

- (i) T. Murphy: Gravity Survey of Central Ireland.
(Geophysical Memoir of the School of Cosmic Physics,
No.2, Part 3).

Summary: A gravity survey has been carried out with a small Graf gravimeter in Central Ireland between the Pendulum Stations at Dublin and Galway. In all, 266 new stations were established.

The Bouguer anomaly at each station was calculated and the results analysed. With the exception of the Galway granite areas the anomaly is everywhere positive. The isostatic anomalies are also positive on any scheme of compensation.

Comparisons have been drawn between the gravity results and the magnetic anomaly map of the Geological Survey and various areas of low Bouguer anomaly have been investigated theoretically. It was found impossible to attribute all the low anomaly areas to light sedimentary rocks, and it is suggested that the density of the Lower Palaeozoics or the Pre-Cambrian metamorphics is, in these areas, less than 2.67 g/cm^3 due to the existence of masses of granite or granitisation. The occurrence of mineralisation in a few of these areas is pointed out.

Thirlaway's suggestion that the Leinster granite extends westwards beneath the Palaeozoic sediments was confirmed, and the extent of the

Galway granite was also found to be much greater than the mapped outcrop. It was detected beneath the limestone in north Co. Clare but on the north-east not beyond the mapped boundary. Its thickness is estimated as 35,000 ft.

A large positive Bouguer anomaly was measured north of Dundalk and from the gradient at this place much larger values are to be expected. They seem to be connected with the Tertiary igneous activity in the Carlingford peninsula.

- (ii) R. Flürth: On the Theory of Stochastic Phenomena and its Application to some Problems of Cosmic Physics.
(Geophysical Bulletin of the School of Cosmic Physics, No.5, July 1952).

Summary: Examples of so-called stochastic (or random) phenomena are given from various fields of physics which are characterised by irregular fluctuations in time of the measured values of observed quantities. A short survey of the fundamental principles of the modern theory of stochastic phenomena is given. The notion of "fluctuation rate" is introduced and the use of the "after-effect function" for the statistical analysis of continuous stochastic processes is discussed. This is illustrated by the application of the theory to the analysis of the scintillation of stars, due to atmospheric disturbances, and the irregular fluctuation of wind speed. The extension of the theory to discontinuous stochastic processes and its application to the study of density fluctuations of particles is briefly discussed. The last part of the paper contains an outline of the theory of the "autocorrelation function" and the "fluctuation spectrum" of stationary stochastic processes and their mutual relationship with some applications to problems of cosmic physics.

- (iii) J. J. McHenry: Condensation Nuclei produced in the Laboratory.
(Geophysical Bulletin of the School of Cosmic Physics, No.6, February 1953).

Summary: Experiments are described on the production of condensation nuclei by the addition of nitric acid or other chemicals to moist air. The mechanism of nucleus formation is discussed. A review of the literature of the subject seems to show that the effect of ammonia and of nitrates in promoting atmospheric precipitation has been minimized and that of sea-salt and sulphuric acid exaggerated.

- (iv) L. W. Pollak: A modified membrane manometer.
(Trans. Ophthalmological Soc. of the United Kingdom, London. Vol.LXXII (1952), pp.242-252).

Summary: A modified Schiötz membrane-manometer for standardising tonometers is described which eliminates certain disadvantages of the original construction so that the instrument is always ready for use.

Publications in Course of Printing:

- T. Murphy: The Magnetic Survey of Ireland for the Epoch 1950-5.
(Geophysical Memoir of the School of Cosmic Physics, No.4).

Publications in Preparation:

- (i) The manuscript of the second edition of Geophysical Memoirs No.1, L. W. Pollak, Eight-Place Supplement to Harmonic Analysis and Synthesis Schedules) has been completed. It consists now of three parts, the third giving the values of λ_2 and λ_2' to 23 decimals of the second.
- (ii) The theory of a new method of measuring the size of submicroscopical particles in an aerosol has been fully worked out by R. Fürth, London University.

A discussion between Fürth and Pollak took place in London on October 4, 1952 and the computation of extensive tables necessary for an experimental use of the method has started in the School.

4. NATIONAL COMMITTEE FOR GEODESY AND GEOPHYSICS.

The inaugural meeting was held on 15 October 1952. Professor Pollak gave in his turn a short account of the work being done by the Geophysical Section and indicated the assistance which the School could give. He suggested that the Committee should undertake national works such as a Hydrographic Survey mentioned by Professor Poole.

5. METEOROLOGICAL AND GEOPHYSICAL SEMINAR.

- 3rd April 1952: Brigadier General K. W. Papworth, Ordnance Survey Division, Belfast; The Remapping of Northern Ireland.
- 1st May 1952: Assistant Professor Thomas Murphy, School of Cosmic Physics, Dublin; Airborne Magnetometer.
- 9th October 1952: Dr. A. T. Doodson, F.R.S., Director, Liverpool Observatory and Tidal Institute; The Tides and their Research Problems.
- 6th November 1952: Mr. G. F. Mitchell, F.T.C.D., Trinity College, Dublin; Climatic Changes in Post-glacial Time.
- 20th November 1952: Professor L. W. Pollak, School of Cosmic Physics, Dublin; Germany revisited.
- 4th December 1952: Professor J. J. McHenry, University College, Cork; The Production of Condensation Nuclei.
- 22nd January 1953: P. A. Heelan, S.J., Dublin; Internal Constitution of the Earth.
- 5th February 1953: Mr. T. Illingworth, Office of Public Works, Dublin; Climate and Comfort.
- 5th March 1953: V. H. Guerrini, Meteorological Office, Shannon Airport; The Hydrological Cycle in Ireland.
- 19th March 1953: Dr. C. Lanczos, National Bureau of Standards, U.C.L.A., Los Angeles, Calif.; Fine Structure Analysis of Periodic Phenomena.

6. MISCELLANEOUS.

(i) Acting Director B. C. Browne, Department for Geodesy and Geophysics, Cambridge, suggested on April 8, 1952 a further and still closer collaboration. Since the Cambridge Department is now constructing a static magnetometer and Professor Murphy a high sensitive spinning magnetometer for remanent magnetism a repeated exchange of views and experience was suggested by Cambridge.

Between May 26 and 28, by invitation, Murphy paid a visit to the Department of Geodesy and Geophysics, Cambridge University, and discussed with Mr. B. C. Browne and Dr. S. K. Runcorn the details of the work being carried out there on the magnetisation of rocks. It was decided how future work should be carried out so that there would be no duplication and arrangements were made for the exchange of rock samples. Possibilities for other geophysical work were also discussed.

(ii) Dr. G. P. Woollard (University of Wisconsin and Woods Hole Oceanographic Institution, Mass.), Chairman of the Special Committee for the Geological and Geophysical Study of the Continents of the American branch of the International Association of Geodesy and Geophysics, visited Dublin on March 1, 1953 in order to link up the Irish gravity measurements to the international gravity network.

(iii) From 30 June to 2 July a party from the Geological Survey and Museum of Great Britain under Dr. W. Bullerwell linked by gravimeter, their stations in the North of Ireland with the Pendulum Station at Dunsink. Professor Murphy has assisted in this work and rechecked some of our more important stations on their journey. Two gravimeters of most up-to-date construction, a "Frost" and a "Worden", have been used.

(iv) On Professor Blackett's advice Dr. J. A. Clegg, University of Manchester, visited Professor Murphy on March 3, 1953, in order to see parts of the high-sensitive magnetometer which Murphy is constructing.

(v) Pollak and Murphy attended the meetings of the German Meteorological and Geophysical Societies in Hamburg from 24th to 30th August 1952. On the journey to and from Hamburg they visited the meteorological and geophysical institutes in Strassbourg, Frankfurt a.M., Göttingen, Fuhsbüttel (Hamburg) and De Bilt (Utrecht). In Frankfurt a.M. a discussion took place with Dr. C. Junge.

A detailed report on the Hamburg meetings and the work in progress in the various institutes visited during the journey has been presented by Pollak in the Meteorological and Geophysical Seminar on 20 November 1952.

(vi) Askania-Werke A.G. Berlin (American Sector) has accepted Professor Pollak's suggestion to place at our disposal the latest type portable gravimeter for a limited time. No rental for the instrument will be charged provided that the gravimeter will be returned within three months after receipt in Dublin. The price of the instrument is approximately \$8000.

D. MacGRIANNA

CLÁRATHÓIR

PÁDRAIG De BRÚN

CATHAOIRLEACH

31 Márta 1953

5. OBSERVATORY

(i) Two Bellani integrating actinometers have been installed in the vicinity of the discontinuously recording thermoelectric solarimeter on the platform of 5, Merrion Square. Regular observations started on June 29, 1953. After testing their agreement one of them will be shielded against direct solar radiation so that both daily totals of radiation from the sky and from the sun will be available. Daily totals of global radiation are published in our "Meteorological Bulletin for Dublin City".

Our experience with these instruments, the first ones used outside Davos and in a windy climate, will be discussed at the meeting of the International Commission for Solar Radiation in Rome, September 1954.

(ii) An evaporigraph using Livingston's porcelain sphere is in operation since July 3, 1953.

6. MISCELLANEOUS

(i) Professor Pollak was invited by the Irish National Committee on Illumination to attend on its behalf the meeting of the Technical Committee on Natural Daylight of the "Commission Internationale de l'Éclairage" in France, to participate in the discussions and to submit to the Irish Committee a report on the proceedings.

The meeting took place in Paris and Royaumont from May 6 to 9 1953.

Since it was the opinion of the delegates that at the Meteorological and Geophysical Section of the School of Cosmic Physics in Dublin extensive experience in work with photocells has been accumulated, the British delegation suggested that Pollak should be asked by the Committee to undertake an investigation into the distribution of sky brightness at different cloudiness in Ireland and in co-operation with the S. African National Committee to develop an appropriate photo-electric instrument. Professor Pollak accepted this suggestion and intends to present the results at the next meeting of the I.C.I. in Zürich in 1955. No measurements of this kind have been undertaken in Ireland or Great Britain.

(ii) Professor Pollak represented the Irish National Committee for Geodesy and Geophysics at the meeting of the Commission for Gravimetry of the International Association of Geodesy in Paris from the 21st to 25th September 1953. In response to the request of the President of the International Commission for Gravity (Rev. Father P. Lejay) he prepared and submitted a report on the state of Ireland's gravimetric work together with the relevant bibliography.

(iii) At the request of Aer Lingus, Professor Murphy examined the workshop at Dublin Airport on June 11, 1953 to determine its suitability for testing and adjustment of aircraft compasses. A positive report summarising his measurements was submitted to the Development Engineer, Aer Lingus, Dublin Airport.

(iv) At the request of the British Department of Scientific and Industrial Research, Building Research Station, Garston, our photo-electric theodolite was demonstrated to Mr. P. Fetherbridge. A short series of comparisons with the visual (subjective) British Schull tele-photometer, which Mr. Fetherbridge brought for this purpose to Dublin, was carried out from 2nd to 4th February 1954.

(v) The Deutscher Wetterdienst, Hamburg, has requested for selected dates daily totals of our solarimeter records required for its synoptic world charts of global radiation since our recorder is the most westerly in Europe.

(vi) The Secretary of the Department of Education, Mr. L. Ó Muirthe, accompanied by the Assistant Secretary, Mr. T. Ó Raifeartaigh visited the Geophysical Section on September 29, 1953. At the Secretary's request he was acquainted with the aim and work of the Section, in particular with the original constructions carried out in the workshop of the Section and their practical value.

PÁDRAIG DE BRÚN

GATHAGIRLSACH

12 Márta 1955